USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Long-term Willamette River Restoration Possibilities and Impacts of Physical Activities on River Processes

Duration: 4/1/99 - 3/31/01

Fiscal Year 1999 Federal Funds:

- Total: $11,526
- Direct: $11,526
- Indirect: $0

Non Federal Funds: $

- Total: $23,569
- Direct:$14,164
- Indirect: $9,404

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Congressional District: Oregon 5th

Critical Need for Research

River restoration, rehabilitation, and re-naturalization are terms f or activities that are now being considered as better whole-system approaches for trying to restore lost ecosystem conditions and to maintain ecosystem health. The scales of action and the degrees of uncertainty are much greater than for past habitat work. Methods are needed for evaluating large-scale river restoration. Because large-scale physical changes and cumulative local physical changes have typically led to deteriorated ecosystem conditions, it is essential to examine physical changes in the context of river restoration actions. This has not yet been done on the scale proposed here for a pilot test of developed concepts.

Local manipulation of aquatic habitat, extensively practiced in Oregon for over two decades, has not been adequate to halt general ecosystem decline and species losses. New ESA species listings each year are not offset by delistings -- which might demonstrate that stream habitat manipulation is working.

A bigger scale of holistic habitat management is evolving under the guidance efforts of some 85 watershed councils in Oregon (Ken Bierly, personal communication, 2/26/99). However, there is no watershed council for the mainstem Willamette nor for lower reaches of its main tributaries. Nor is there a counterpart of a watershed council to

address Willamette River restoration needs, although the recent Willamette River Basin Task Force considered some elements. U.S. Corps of Engineers programs have the potential to address such needs, but technical activities have been limited by non-technical constraints (e.g., cost sharing, local sponsorship).

The mainstem Willamette River and lower reaches of tributaries are precisely where some of the larger restoration opportunities still remain. But population pressures continue to increase irreversible land-use commitments adjacent to the river near urban areas. Space for potential restoration activities is being reduced each year through decisions by local governments and land owners that force further constraints on the river channel and on flow management.

Meanwhile, state efforts to rebuild salmon runs have increased the biological/ecological attention, activities, and funding to alter riverine habitat toward more "restored" conditions. Biological experiments are being conducted or proposed to alter physical conditions along the river -- so far with little involvement of specialists in river physical processes. Large-scale change of physical systems requires very great care and planning, to avoid the risk of failure and loss of needed public support for large- scale restoration.

Unfortunately, efforts apply general knowledge of physical processes to specific reaches of the mainstem Willamette have had limited support. Consequently, important information about physical processes needed for ecological and restoration planning is not available and must be "guessed" by those needing the information. There are many uncertainties in trying to manipulate highly complex systems, such as a river ecosystem. Research must be conducted at a different level than past local habitat studies to address the bigger spatial and time scales involved.

EXPECTED RESULTS, BENEFITS, INFORMATION

This investigation will lead to a tighter understanding of physical impacts on the mainstem of the Willamette River caused by past physical alterations of the river corridor. The changes are mainly related to erosion control works, dredging, and structures of various types. Changes also occur due to river discharge control. Past fragmented work on these topics will be unified from the physical-process viewpoint as the initial part of this project.

Physical methods to alleviate channel encroachment, to reestablish floodplain floodwater storage, and to restore channel complexity will be delineated. The role of reservoir discharge regulation to present or potentially alterable physical features of the river corridor will be also assessed.

Institutional requirements and societal information needs to conduct major river restoration will be examined in the context of proposing physical changes.

Strategies will be proposed for developing long-term restoration for a Willamette River reach, including recommendations regarding environmental assessments, burdens of proof, andperformance-and- success measurement criteria for use in the decision process.

Application of the foregoing work will be made through a pilot test for a selected local zone of the mainstem Willamette River.

GOALS AND OBJECTIVES

The basic goal is to explore possibilities for long-term Willamette River restoration, as related to the impacts on river processes of past physical alterations and current physical activities. Impacts and restoration options involve the physical aspects of river processes, encompassing hydraulics, hydrology, channel morphology, sediment transport, and water quality. These processes are related to floods, aquatic habitat, and other natural physical events. Restoration involves use of physical space that may also have other uses and commitments. Consequently, the potential societal and institutional barriers to or conflicts with restoration must be considered.

Specific objectives are to:

1) review past physical alterations of the river corridor related to erosion control (revetments and dikes), dredging (for gravel mining or channel alignment) , and local structures (for bridge crossings or waterfront development), including the longer-term impacts of alterations on physical processes.

2) determine the physical possibilities for alleviating channel encroachment, reestablishing floodplain floodwater storage, and restoring channel complexity (in terms of planform features and channel geomorphology), while protecting population centers and vital facility crossings. 3) assess the relations of reservoir regulation and f lood and low-f low water discharges with present and potentially altered physical features of the river corridor.

4) examine institutional requirements and societal inf ormation needs to conduct major-river restoration.

5) explore strategies for developing long-term restoration for a long reach of the Willamette River or large local zones, including environmental assessment, burdens of proof, and performance-and-success measurement criteria for use in the decision process.

6) develop a pilot test for a selected local zone, in concert with the Gregory-Hulse GIS team, of the developed concepts and analyses for physical assessment of river restoration.